

O19.4**The willow in the intertidal reduces flow velocity even during winter with possible implications for tidal wetland restoration and nature-based adaptation to SLR**

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Abstract

Willow floodplain plantations are proposed as part of plans to create tidal wetlands for ecosystem-based flooding defence with high potential since they grow high in the intertidal. Willow forests characterize riparian floodplains in Europe up to the river mouth, e.g., in tidal wetlands along the Scheldt and Rhine-Meuse estuaries, Ems, Weser, Elbe, and the Thames estuary. Today, they are largely fragmented and have to be restored according to conservation policies.

We studied what conditions along the estuarine salinity and flooding gradient two keystone willow species, *Salix alba* L. and *Salix viminalis* L., tolerate with tidal treatment and tested biophysical traits and bending capacity. Second, effects of living juvenile willows on flow velocity were studied in summer and winter in flume tests.

Permanent and semi-permanent flooding of roots and periodic flooding of shoots reduced biophysical traits but partial submergence did not affect biophysical traits. Shoot diameter and length was larger for *S. viminalis* resulting in higher bending capacity but *S. alba* showed more consistent results. In the flume, flow velocity decreased within the leafy willow canopy but was less reduced above and below the canopy during summer whereas in winter, flow velocity inside the leafless canopy was reduced but less reduced compared to summer. However, flow reduction above the canopy and near bed flow reduction is greater during winter when storm surges mainly occur. Generally, flow velocity was most reduced directly behind the willows and increased with vegetated test section length.

The willow is useful for tidal wetland restoration and may be a supplemental feature for nature-based adaptation to SLR with increasing flooding when applied high in the intertidal in front of the dike line. More research in the large flume and the field and on effects of harsh short time salinity increases (e.g., during storm surges) on the willow is needed.

Keywords

tidal forest, willow, coastal defence, wetland restoration